Chapter 11
The Truth About Accuracy

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> *The goal of inquiry is substantial, significant, illuminating truth.*
>
> (Haack 1994, p. 203)

Abstract When we evaluate the outcomes of investigative actions as justified or unjustified, good or bad, rational or irrational, we make, in a broad sense of the term, evaluative judgments about them. We look at operational accuracy as a desirable and evaluable quality of the outcomes and explore how the concepts of accuracy and precision, on the basis of insights borrowed from pragmatics and measurement theory, can be seen to do useful work in epistemology. Operational accuracy (but not metaphysical accuracy!) focuses on how a statement fits an explicit or implicit standard set by participants involved in a shared project. While truth can remain a thin semantic property of propositions, operational accuracy, as a quality of an outcome of inquiry and typically attached to a statement, a model, a diagram or a representation is an evaluation based on the non-epistemic goals set by the goal of inquiry (which every inquiry has), and a substantial evaluative notion. The goals, often made explicit by relevant questions in a context of inquiry, act as a filter, with truths a reliable epistemic method has access to functioning as input, and *accurate representations* as its output. Responsible inquiry seeks pragmatic equilibrium between what reliable knowledge on the one hand and degrees of accuracy required by the goal of inquiry.

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C. Martini, M. Boumans (eds.), *Experts and Consensus in Social Science*,
Ethical Economy 50, DOI 10.1007/978-3-319-08551-7_11

11.1 Introduction

When we evaluate the outcomes of investigative actions as justified or unjustified, good or bad, rational or irrational, we make, in a broad sense of the term, evaluative judgments about them.[1] We look at operational accuracy as a desirable quality of outcomes of investigative actions, typically put forward as contributions to purposive exchanges between informants engaged in shared projects. Following those who seek to distinguish good from bad knowledge (Stephen Hetherington), what one ought to and what shouldn't be known (Miranda Fricker) or what counts as valuable knowledge (Stephen Grimm), we ask what it takes to acquire and provide *accurate* information, as well as how accuracy and the reliability of investigative methods interact. Inaccurate truths are easy to obtain, and we could not easily be mistaken about them – our knowledge of them is "safe". So, while the truth exerts a powerful attraction, serious inquiry – inquiry with a purpose (and sheer curiosity can make any subject matter interesting) should deliver *accurate* truths. What counts as an accurate truth (or set of truths) ultimately depends on the non-epistemic goals of the exchange. Unimpeded by extra-epistemic constraints on what one ought to know, aiming at truth is reduced to a pointless game. Standards of accuracy – what will count as accurate information – will ultimately be dependent on what we ought to know given the project that motivates the investigative effort that engages us.[2]

The sake for which we seek knowledge about a subject matter cannot itself be defined in epistemic terms; any reason why X wants to know *p* derives from a non-epistemic project, perhaps ultimately driven by pure curiosity (as Hume pointed out in the *Treatise*, and Jane Heal forcefully argued). We want "truth as such, but not for its own sake" (Heal 1988; Sosa 2003). But accuracy, like *relevance* and *salience*, is an elusive notion (Schelling 1960). Our aim in this chapter is to *precisify* a useful concept in epistemology and philosophy of science by locating it within a network of epistemic and practical principles. Accuracy is too useful to be identified with truth.

Begin with a *prima facie* objection: isn't accuracy just a synonym for truth? Ernest Sosa begins a recent presentation of his acclaimed virtue approach to knowledge with the thesis that "[b]elief is a kind of performance, which attains one level of success if it is true (or accurate)" (Sosa 2011, p. 3).[3] The principle that "an epistemic agent ought to approximate the truth", is called *Accuracy* by Leitgeb

[1] We would like to thank Marcel Boumans, Carlo Martini, Chris Kelp and participants at the Bayreuth Conference for valuable suggestions.

[2] The *as such/not for its own sake*- qualification precludes the reduction of truth to some other value (the value we attach to the sake itself).

[3] Ernest Sosa holds that belief aims at truth and that we want correct answers (Sosa 2011, p. 56).

and Pettigrew (2010). In a paper that explores what makes truth good, Linda Zagzebski holds that "[b]elief aims at accurately representing some part of reality propositionally. When a belief is true it is accurate" (Zagzebski 2004, pp. 135–6, note omitted). Bernard Williams (2002) defines what the virtue of *Accuracy* (which is itself, according to him, the counterpart of another veritistic virtue, *Sincerity*) in terms of truth:

> If someone seriously wants to find out the truth on an issue, we can say that this is equivalent to his wanting to get into the following condition: If *p*, to believe that *p*, and if not *p*, to believe that not *p*. (Williams 2002, p. 133)

Williams characterizes *Accuracy* (as *he* uses the term) as "the desire for truth 'for its own sake' – the passion for getting it right" (Williams 2002, p. 126), but we have already indicated that the desire for truth "for its own sake" is questionable. Williams is of course aware of that: the conversational implicature suggested by the definite article in "finding out *the* truth", intimates that the concern is to find the accurate and/or relevant truths in view of one's non-epistemic aims and goals.[4] In "accurate truths" the adjective's role is not pleonastic. "True, but wholly inaccurate" suggests a severe criticism.

While accuracy is arguably a thick evaluative concept, truth-minimalists reject that truth itself is an evaluative concept (Horwich 1998). Although the concept often appears in norms like "one should assert what is true", minimalism holds that such norms are mere generalizations of particular norms as "One should asserts that grass is green only if grass is green". Moreover, the normativity of a concept does not follow from its appearance in a norm, for that would entail that any concept is normative ("being over 18" can appear in a hypothetical norm, but it is clearly not an intrinsically normative concept). Donald Davidson and Allan Gibbard have questioned whether truth can count as the aim of inquiry (Davidson 2005; Gibbard 2007), suggesting that truth is a goal in name only and that what matters are the justifications one provides. Jane Heal (1988/89), in a neglected paper defending minimalism about truth, holds that we never seek truth for its own sake. When someone's actions can be described as trying to find out the truth, a further more specific description under which her investigative action was intentional is always possible, and the description articulates a goal the agent holds because it is derived from the overall project in which her investigative action has a proper place.

[4] If, as Grimm (2008) points out, "we think that pursuing the truth is intrinsically valuable, then why are we unapologetically indifferent to so many truths? If you propose an evening memorizing the phone book for Topeka, Kansas and I decline, have I really missed an opportunity to enrich myself, from an epistemic point of view? If the truth is always intrinsically worth pursuing, then it seems that I have. And yet that conclusion seems ridiculous" (Grimm 2008, pp. 725–26). Talk of pursuing the truth is highly misleading, as Hookway (2007) points out: "We seek answers to our questions which are relevant, illuminating and useful, so truth is, at most, one among a set of standards that we use in evaluating inquiries" (Hookway 2007, p. 2).

Goldman (1999) concurs. Heal also points out that this strategy need not assume a non-relational conception of truth. Even if we seek "correspondence" between us and the world, correspondence as such is not the goal of inquiry. Inquiry aims at finding out whether *p*, not whether a certain relation between the inquirer and the world holds. It is the fact that *p* that matters for one's projects, not the relation between the inquirer and that fact.

Our first proposal is therefore to distinguish the *thick* concept of accuracy from the thin notion of truth.[5] What counts as accurate or inaccurate information clearly varies with the purpose of the model or representation it is supposed to qualify. As Van Fraassen puts it, "[t]he evaluation as accurate or inaccurate is highly context-dependent. A subway map, for example, is typically not to scale, but only shows topological structure. Relative to its typical use and our typical needs, it is accurate; with a change in use or need, it would at once have to be classified as inaccurate" (van Fraassen 2008, p. 15).[6] Note that Van Fraassen does not speak of the truth of a subway map (can maps be true?) and that few would accept that truth or falsity would be highly context-dependent.

According to Teller (2004, 2009), scientific representations should not be thought of as true or false. While it makes perfect sense to talk of one theory being more accurate than another and therefore "closer to the truth", none of our theories are flat-footedly true. Teller's suggestion, however, confuses the useful idea of approximating standards of accuracy with the more contentious idea of metaphysical truth approximation.[7] Moreover, it would involve an implausible *error theory* about accuracy because, if Teller were right about ineliminable discrepancies between a representation and its target, no representation could ever be completely accurate.[8] Secondly, the claim that every model misrepresents its object and that all representations are therefore inaccurate confuses what is *absent from a representation* with what a representation *misrepresents as being the case*. Thirdly, inaccurate knowledge is – on the account presented here – not an oxymoron, for known truths can be inaccurate, and inaccurate statements often

[5] Minimalists can hold that the descriptive element in the concept of accuracy is simply truth; a theory of what counts as accurate explores the evaluative aspect of accuracy. The extension of a thick concept cannot be determined without sharing or imaginatively entering the insider's evaluative point of view. The insider's point of view in the case of accuracy is recognition of the project one needs accurate information for.

[6] According to G.L. Hallett, "[i]t is in general desirable for tables, maps, statistics and descriptions to be accurate, as it is for statements to be true. Accuracy is usually a virtue, as truth is, and to say that something is accurate is generally to praise it" (Hallett 1988, p. 83).

[7] Tal (2011) suggests that the correlate concept of metaphysical measurement accuracy is truth. The counterpart of operational measurement accuracy is standardization. More on the relevance of standards in Sects. 11.2 and 11.3.

[8] An error theory about *flatness* was famously developed in Unger (1975).

convey falsehoods and/or reveal inappropriate choices of standards.[9,10] It seems then that cashing out accuracy as "approximating the truth" doesn't really capture what is useful about the concept. Teller's measurement-analogy suggests that it might useful to turn to the science of measurement for further refinement of the concept and we will pursue that analogy later in this chapter. Tal (2011) discusses, in the context of measurement theory, no less than five different notions of measurement accuracy. *Metaphysical measurement accuracy* is the closeness of agreement between a measured value of a quantity and its true value which suggests, under a traditional understanding of truth as correspondence with a mind-independent reality, a form of realism about quantities. Epistemic accuracy refers to the closeness of agreement among values reasonably attributed to a quantity based on its measurement. The correlate concept is (un)certainty. Comparative accuracy refers to the closeness of agreement among values of a quantity obtained by using different measuring systems. Its correlate concept is reproducibility. Finally there is the pragmatic measurement notion of being accurate for, where the measurement meets the requirements of a specific application (Tal 2011). Operational measurement accuracy – closeness of agreement between a measured value of a quality and a value of that quantity obtained by reference to a measurement standard – serves best the concept under scrutiny. Metaphysical measurement accuracy, on the other hand, is the closeness of agreement between a measurement value and its "true value", but it is usually assumed in physics that, in this sense, the true value of a physical magnitude is simply unknowable. The analogy would make truth (and therefore accuracy) by definition unattainable. The focus must therefore be on the relation between a statement and some standard in view of which it will be evaluated as (in)accurate.[11] This suggests a further objection to Teller's approach: the operational accuracy of a measurement result assumes that the standards are set in such a way that they are attainable and that attainment can be recognized by us. If truth were the fixed standard of accuracy that holds in all contexts of inquiry,

[9] Teller (2009) connects precision, accuracy and truth as follows: "The way we talk, and even more strikingly, the way we think about our subject matters, all seems to operate in terms of determinate truths, unqualified in any way by either imprecision or inaccuracy. How can this be if, as I claim, inexactness is ubiquitous?" (Teller 2009, p. 15). See http://maleficent.ucdavis.edu:8080/paul/manuscripts-and-talks/T-F%20In%20Science (consulted July 2013). In the same paper, Teller holds that "A representation is inaccurate insofar as there are discrepancies between the representation's target and the way the representation represents the target as being. If the true value of a quantity is 6, characterizing that value as 5.9 is precise, but inaccurate" (Teller 2009, p. 2). If (public) representations are seen as models, it should be obvious (hence not a disqualifying feature) that they will be imprecise, incomplete, not without assumptions, etc. Is the well-known model of London's subway map accurate? Yes – for the purposes of the visitor.

[10] Braun and Sider (2007) defend an error theory about truth: "Truth is an impossible standard that we never achieve. [...] (I)t would be pointlessly fussy to enforce this standard to the letter, requiring the (exact) truth, ... nor would it be desirable to try, for the difference between the legitimate disambiguations of our sentences are rarely significant to us" (Braun and Sider 2006, p. 135).

[11] Tal's definitions are inspired by the *International Vocabulary of Metrology* (VIM).

recognizing the accuracy of a statement would be problematic since, as Frege pointed out in *Der Gedanke*, truth is an unrecognizable property.

In Sect. 11.2 we explore and defend the distinction between truth and accuracy and show that they qualify different objects. In Sect. 11.3 we look at accuracy as a distinctive quality of contributions to conversational exchanges: how is accuracy created, how are investigative actions with accurate outcomes obtained, and who is in charge of saying what is and what isn't going to count as accurate information? We start with some Gricean examples, but the key analogy will be drawn from measurement theory and the interaction between accuracy and precision in measurement (Sect. 11.4). In the final section (Sect. 11.5) we reject Alvin Goldman's *veritistic* characterization of experts as those who "know more about a subject matter" (Goldman 1999). A key element in distinguishing laymen from experts is the degree of accuracy (and not just truth) of the latter's contributions, relative to their domain of expertise, combined with the capacity to set the appropriate standards of accuracy required by the goal of the investigative action in which they are engaged or are being asked to contribute.[12]

11.2 Accuracy Entails Truth

What speaks against identifying of truth with accuracy is that while truth is a thin concept, accuracy is arguably *thick*. Qualifying a model, representation, diagnosis, assessment or contribution as accurate (or not accurate, or not very accurate, or as more accurate than was required) is an appraisal, not only of the contribution itself but also of the agent who made it, who was responsible for the accurate model or result. Accuracy, unlike truth, easily transfers from statements to agents, and one can be accurate at one epistemic task but not at others. Unlike truth, accuracy unproblematically admits of degrees.

Against identifying the concepts of truth and accuracy (or speaking the truth and speaking accurately) also speak broadly Gricean considerations, which suggest that an accurate statement can be false. "Everyone in the room speaks French" may be accurate, but not (strictly) true. A model or simulation may be said to be accurate enough for some purpose but not for another, even if the model itself is strictly speaking false which explains why models and simulations are sometimes thought of as "useful fictions." "France is hexagonal" is literally false, but seems accurate if "Italy is booth-shaped" is also accepted as accurate. We discard this family of objections, first on the grounds, already mentioned, that truth and accuracy are often used interchangeably, which suggests that a statement's being accurate (for some purpose) but strictly speaking false depends on how we single out the proposition

[12] Another argument against a purely veritistic characterization of experts is that, paradoxically, laymen run a lesser risk of having false beliefs because they have fewer beliefs about a domain or subject matter.

expressed by the statement to be qualified. By invoking the principle that propositions expressed by assertions can contain unarticulated constituents and that one such unarticulated constituent is (in the relevant cases) the "roughly" or "more or less"-operator: if *France is hexagonal* is roughly true, then it is and objective, unqualified truth that France is roughly hexagonal. Similarly, if it is more or less true that the room is full of speakers who speak French, it is true (simpliciter) that the room is more or less full with speakers who speak French (Horwich 1998, p. 63). Statements that are "more or less", "roughly" or "approximately" or "sort of" true are equivalent with *unqualified* truths when the unarticulated constituent – in this case an operator – is integrated in the proposition qualified as true or false. What is *strictly speaking* false may, with the help of unarticulated "more or less" or "sort of"-operator, be transformed into an asserted plain truth. Interpretative charity (of the Gricean or Davidsonian kind) suggests that some such operation is ubiquitous in micro-interpretation. The fact that the compositionally determined minimal semantic content of a sentence – its *literal meaning* – is almost never literally true on occasions of use doesn't entail that we cannot successfully use such a sentence to make true or accurate assertions (Borg 2005; Cappelen and Lepore 2004). What we literally say is often under-articulated, underspecified and/or imprecise because a more precise articulation would take too much time and/or cognitive effort. What can be plausibly inferred by the intended audience need not be explicitly articulated by the speaker (Levinson 2000). Semantic and pragmatic considerations thus speak *for* and not *against* the claim that accuracy entails truth. Finally, it should be noted that while every accurate statement is also true, not every useful statement (or belief, for that matter) need to be true. There are patently false beliefs that are useful – just think of placebo effects, for example, and how they constitutively depend on having false beliefs about certain pills. No amount of tinkering with semantic contents can make such useful-but-false beliefs true.

11.3 Accuracy Is More than Truth

Further arguments give credence to the claim that accurate truths involving a domain *D* are a strict subset of the possible informative truths about *D*. Consider Grice's well-known example: A is planning with B an itinerary for a holiday in France. Both know that A wants to see his friend C, if doing so would not involve too great a prolongation of the journey.

A: Where does C live?
B: Somewhere in the South of France.

B's answer is, as he very well knows, less informative than is required to meet A's needs. This infringement of the *Maxim of Quantity* ("Make your contribution as informative as is required for the current purposes of the conversation") can be explained only on the supposition that B is aware that being more informative would require saying something that infringed on the *Maxim of Quality*, ("Don't say

what you lack adequate evidence for"). Consequently, B implies that he does not know in which town C lives (Grice 1967/1989, p. 34). Grice's abductive explanation assumes that it is common knowledge among the participants what would count as an accurate answer. Although what B says is true, a more informative answer would infringe on the maxim of *Quality*. This would explain why B's contribution implicates that he does not know where C lives, *given* the informal standard of what would count as accurate in the conversation (and made explicit in Grice's gloss that accompanies his example; the gloss is supposed to make explicit what the participants, on the basis of the Cooperative Principle, agree is the purpose or general direction of the conversation).

The example illustrates how the *practical purpose* of the informative transaction fixes what will count as an *accurate* (and not just *true*) answer.[13] If A and B were to discuss C's secret whereabouts on a need-to-know standard, B's original answer would have been accurate enough. The operative standards of accuracy in an epistemic exchange are therefore a function of the project one is engaged (where to go, how to build a plane that carries 520 passengers over at least 8,000 miles, etc.,).[14] Merely telling and acquiring truths (or justified truths) independently of a mutually recognized project would be a parody of a purposive conversation. Note that I can provide accurate information, given that I know what you need to know in order to realize your non-epistemic purposes. But I do not thereby have to adopt your goals, which determine why you want to know what you just asked me.

An assertion's accuracy cannot be transferred to what the proposition that specifies the asserted content logically entails. If there were 520 passengers on the plane, there were also more than 200 on the plane, but the latter truth is inaccurate if we want to know how many passengers died in the crash. Although one can *say* that it is "not inaccurate" to assert that there were more than 200 passengers on the plane (and especially so if one doesn't know better), such a remark would in this context surely be dismissed as inappropriate or even misleading.

Epistemologists often object to the unqualified principle *that we should believe the truth*, under the bidirectional reading that (i) we ought to believe what is true, and that (ii) our beliefs ought to be true (Goldman 1999; Sosa 2003; Piller 2008). Why invest costly epistemic efforts in irrelevant subjects just because the epistemic actions yield true beliefs (Grimm 2008, p. 731)? Acquiring true beliefs is, as such, not a good way to measure how we benefit from investigative actions (Heal 1988) Ernest Sosa demurs concerning the claim that truth itself ("as such") is valuable:

> At the beach on a lazy summer afternoon, we might scoop a handful of sand and carefully count the grains. This would give us an otherwise unremarked truth, something that on the view before us [truth as such is valuable] is at least a positive good, other things equal. This view I hardly understand . . . it is hard to see any sort of *value* in one's having that truth. (Sosa 2003; pp. 44–5)

[13] Pragmatists would define the *true* answer with the one that satisfies our non-epistemic purposes. This cannot be correct, for false beliefs also help us realize extra-epistemic goals. There are useful falsehoods and useless truths.

[14] See Hempel 1965, p. 333 for a defense of a purely intellectual interest in truth.

Lots of truths can be found in any domain, but a genuine interest in a domain or subject matter will necessarily be motivated by projects which determine what will be accurate information about that subject matter, the kind of things you *need to know* in order to successfully move forward. Even if one's investigative efforts into a domain are motivated by Humean curiosity, any sensible inquirer will set for himself standards of accuracy, and only when attainable by the inquirer, will they count as reasonable standards (an observation already made by David Hume in the Treatise, but going back to remarks of Cicero in *De Officiis*). Indicators of the veritistic quality of an assertion or belief, like coherence or simplicity, do not suffice to turn truths into accurate truths (an inaccurate truth can be perfectly well justified). Neither is accuracy a direct function of the evidence one possesses. It is *the sake for which we seek truths* – the project in which inquiry is necessarily embedded – from which standards of accuracy must derived. The value of the goal of truth is fully swamped by the further goal of acquiring and exchanging accurate knowledge (recall that accuracy entails truth). The question "Why do you want to know that?" points at what will provide the source of the standard of accuracy required to give a useful answer.

Thirdly, we already pointed out that unlike accuracy, truth doesn't admit of *degrees* (Crane 2014). If two statements S and S' both express true propositions, one cannot be *more* true than the other, but in the same context of inquiry S can be more accurate than S' (but see Elgin 2004, Braun and Sider 2006 for dissent).[15] William James held that truth itself is created ("Truth is made, just as health, wealth and strength are made, in the course of experience" (James 1907, p. 218)). What James mistakenly attributes to truth *is* in fact true of accurate statements. Standards of accuracy are created and not found, and they must be designed so that they can be recognizably attained in the course of inquiry by the inquirer. What is going to count as an accurate result, answer or statement depends on an implicitly or explicitly set standard, set by agents in view of their projects and the subject matter they investigate. Experts can decide what is going to count as accurate enough in a certain context, given a well-designed project or purpose.

Fourth, the accuracy of a statement is a relational and recognizable property, while truth is, not only on the minimalist account of the concept, neither relational nor recognizable. Where Frege held in *The Thought* that the property of being true, unlike the property of being yellow, is *not* recognizable, Dummett's analogy between truth and winning a game assumes that truth is a recognizable property:

> It is part of the concept of winning a game that a player plays to win, and this part of the concept is not conveyed by a classification of the end positions into winning ones and losing ones. Likewise, it is part of the concept of truth that we aim at making true statements. We cannot in general suppose that we give a proper account of a concept by describing those circumstances in which we do, and those in which we do not make use of the relevant word, by describing the usage of the word; we must also give an account of the point of the concept, explain what we use the word for. (Dummett 1959, pp. 142, 149)

[15] J.L. Austin famously held that "true" and "false" indicate "a general dimension of being a right or proper thing to say, as opposed to a wrong thing, in these circumstances" (Austin 1962, p. 145).

One can recognize a winning position on a chessboard, but the truth of a belief or statement does, as Donald Davidson put it, "not come with a 'mark' like the date in the corner of some photographs, which distinguishes them from falsehoods. The best we can do is test, experiment, keep an open mind . . . Since it is neither a visible target, nor recognizable when achieved, there is no point in calling truth a goal" (Davidson 2005, p. 6). Since Accuracy relates a statement with a standard, the operative standards of accuracy should be recognizable by us.[16,17] The assessment of a statement as accurate (in a context) involves a comparison of a statement or obtained result with a (public) operational standard. (It may well be that identifying truth with accuracy explains the tendency to seek recognizable standards for truth.) The setting of operative standards for what is going to count as accurate and their attainability is informed by what ultimately motivates inquiry. Not that setting the standard is always a difficult matter. The operative standard may sometimes simply be set by the relevant Yes/No-question ("What happened? Did a bomb explode, or was there a gas leak?"), where the conversational context indicates what counts as an accurate (and not just true) answer. "Something happened" is a true but inaccurate answer.

11.4 Accuracy and Reliability: Interactions

We now leave behind the Gricean analogy and explore a further analogy with accuracy as used in measurement theory. In measurement theory, the degree of *accuracy* indicates the degree of closeness of a measured or calculated quantity to its reference value, sometimes misleadingly referred to as the "true value", for no measurement is absolutely (i.e. metaphysically) accurate.[18] Its complementary concept is *precision*, which indicates the degree to which a *series* of measurements or calculations have similar outcomes. Precision reflects the reliability of the method that yields measurement results. This gives us four qualifications of the outcomes of such an inquiry:

Accurate and precise (d)
Inaccurate, but precise (a)
Accurate but imprecise (b)
Inaccurate and imprecise (c)

[16] Frege held that "[t]ruth is not a quality that corresponds with a particular kind of sense-impression. . .. That the sun has risen is seen to be true on the basis of sense-impressions. But being true is not a material, perceptible property" (Frege 1918/1999, p. 88).

[17] "In principle", because we may not yet have designed or developed the instruments or measurement tools that yield results accurate enough for our purposes, and it may be impossible to design tools that will work sufficiently accurately to realize our non-epistemic goals. Thanks to Chris Kelp for help here.

[18] It is impossible to make a perfectly precise measurement (see footnote 3).

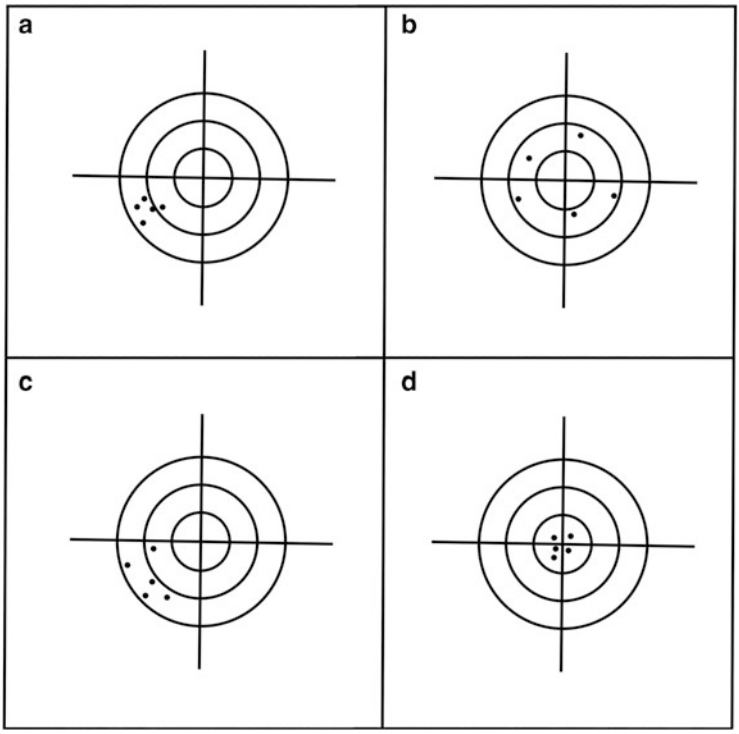

Fig. 11.1 Accuracy and precision

In measurement theory *precision* refers to the similarity of a series of measurement results, while *accuracy* is obtained if a token is close enough to an independently fixed value (the *standard*). Only when *accuracy* (a property of a token result) and *precision* (a property of a pattern of tokens, or a type) are as required by the standards is a measurement result deemed *valid*. The relevant correlative concept of the measurement-theoretic notion of precision in epistemology is that of a *reliable process*. Note, first, that even extremely reliable methods need not yield accurate truths. Very precise measurements can be "off the mark" (see Fig. 11.1, upper left corner). Just as the overall precision (reliability) of a series of measurement results depends on its repeatability, a reliable epistemic process must be robust, *i.e*. hold in the actual world and in nearby possible worlds.[19] In his version of a reliabilist account of knowledge, Robert Nozick's *modus operandi* are tracking connections which correspond with the fact believed (see Nozick 1981): (i) if p were not true, the agent wouldn't believe that p, and (ii) if p were true (under circumstances slightly differing from those actually obtaining), he would (still) believe that p obtains. Once it is assumed that knowledge is, among other things, true belief

[19] Repeatability and reproducibility can be given an intra-world reading or an inter-world reading.

acquired via reliable methods – a quite uncontroversial assumption – the question arises what the method is supposed to be reliable for: producing a true belief in exactly those circumstances in which it is actually deployed, producing a true belief in circumstances much like those actually obtaining, producing a true belief in all the circumstances likely enough to be worth considering, or producing a true belief in all possible circumstances (Craig 1999, p. 54)? The answer must refer to the project in which the investigative efforts are embedded, and it can reflect what the epistemic risks one is prepared to take: can we afford to come to know a very accurate truth with a method which, in very nearby possible worlds, would yield blatant falsehoods? A variant of Nozick's account is the safety approach (Williamson 2000): *S* knows that *p* only if, in many nearby worlds where *S* believes that *p*, *p* is true. One knows that *p* only if the belief could not have easily been false. What if the standard of accuracy requires that in many nearby worlds one's methods no longer yield reliable results?

Reliability is, like its counterpart *precision* in measurement theory, characterized by a *consistent pattern* in the outcomes (as in cases (a) and (d) in Fig. 11.1) and a type-token distinction: a token is reliably produced if it falls under a type of process that produces "true" tokens in similar circumstances and/or under similar conditions. But however reliable the outcomes, true beliefs produced by a reliable process *R* may be wholly *inaccurate* (see case (a) in Fig. 11.1). To return to Grice's example: suppose that B is a very reliable informant with respect to C's country-wise whereabouts: in the actual world and in many nearby worlds, B has true beliefs about C's location – France or England. Yet it doesn't follow that B can give the information required by those who seek C's *exact* location in France or England. His expertise (expertise here defined in terms of reliability) doesn't yield accurate information. Alternatively, B may have come to know C's exact location in France, but only accidentally so (he may have incidentally overheard a conversation in which C's whereabouts were pointed out in quite some detail). Under such conditions he provides accurate information based on an unreliable process. Since accuracy, unlike precision, is a property of individual tokens, the unreliability of the method undercuts the epistemic status (true belief, but not knowledge), but not its accuracy. What he said was accurate relative to the purposes at hand. Note that if A does not knows that C is in France, then B's assertion is informative, yet inaccurate while if he does know that C is in France, the statement is both uninformative and inaccurate.

There is a further difference between reliability and accuracy. The kind of accuracy required for an investigative action to be successful is fixed by goals and projects of the inquirer and features of the domain of investigation. Fixing one's goals usually falls under intentional control: we deliberate about them, they are often subject to negotiation, and they may be morally and practically evaluated. These goals determine what we should or need to know, and fix standards for what will count as accurate information. The reliability of belief-forming processes, on the other hand, is typically *not* directly accessible to agents (think of perception, for example). One can be very reliable at a cognitive task, with little or no understanding of what makes one reliable. Our grasp of belief-forming mechanisms may be

largely tacit. This is one further reason why reliable believers cannot be praised as such: only when the appropriate reliable processes are mobilized to further the acquisition of accurate beliefs – things they need to know – can their epistemic actions be evaluated. In order for reliability to become a feature agents can bring under intentional control, it is therefore useful to make a distinction between the *reliable methods* on the one hand and *reliable processes* agents don't have access to. The choice of a method is, like the standard of accuracy set for oneself, determined by one's extra-epistemic goals and an epistemic agent is responsible for the choice of method.

11.5 How Accuracy and Reliability Interact

Truth doesn't compete with accuracy. Both fit together in the sense that the focus of our epistemic aim is set by non-epistemic goals that direct investigative actions towards finding out the accurate truths, the ones we need to know in order to realize our projects (again, the project may simply be to come to understand the issue, or to satisfy our curiosity). The degree of accuracy required by a project in a context c will interact with the epistemic methods available to the agent in c: the standards must be such that the method to be followed can attain them. Obtaining accurate information can be costly. On the other hand, it doesn't make sense to seek very accurate information if that would require costly epistemic efforts unmotivated by goals that motivated the inquiry. Progress in science and technology is often indicated by setting more ambitious standards of accuracy, driven by the attainability of new goals by improved technology.[20]

Second observation: Agents need not *share* non-epistemic goals to agree about what will count as accurate data, given one of the participant's non-epistemic goals and the epistemic actions required to achieve that goal.[21] Setting standards unrealistically high, given the available methods in the agent's context of inquiry, puts one at fault for being too ambitious. Setting standards too low makes accurate truths easily attainable but almost certainly useless for the purposes they are supposed to serve. Responsible inquirers manage to strike a balance between the choice of epistemic methods weighted against the level of accuracy required by their goals; the required level of reliability sometimes requires that one lowers the standards of accuracy: too accurate truths may be difficult to obtain. The promise of acquiring very accurate truths can justify costly epistemic efforts, the cost mainly due to maintaining sufficient reliability of the methods deployed. In general, it cannot be

[20] Goldman (1986, p. 98) holds that "truth acquisition is often desired for its own sake, not for ulterior ends". But we are not interested in every truth: it is a *subject matter* that elicits curiosity but even then only *accurate* truths will interest us.

[21] When stakes are high or become more complex, negotiating the relevant standards will take on a more formal character. *Standardization* has become a thriving industry.

the purpose of epistemic interactions that contributors feed each other with inaccurate truths collected via extremely reliable methods, or extremely accurate truths acquired via very unreliable methods. When asked for information that cannot be obtained via reliable methods or that will be highly inaccurate, epistemically responsible informants should *signal* a disequilibrium between standards and the epistemic method deployed.[22]

The account of accuracy proposed here suggests that it is questionable whether it is even *prima facie* good to believe or seek trivial truths, as Lynch (2004, p. 55) seems to hold. What *is* open-ended and by definition true is that any subject matter may be of interest to us, but it does not follow that it is the truth *as such* that we want (Grimm 2008, p. 730). Aristotle's dictum that all humans desire knowledge is therefore only half true (as one might say). We desire *accurate* knowledge because epistemic efforts are by their very nature embedded in non-epistemic projects (Heal 1988). Even pure curiosity requires a sense of what accurate truths about a subject matter would consist in (trivial, easily obtainable truths about a subject matter do not satisfy one's curiosity). The familiar dictum that "the truth is hard to find" must mean that *accurate* information about a designated subject matter may be hard to find. As Craig (1999, p. 223) points out, it is implausible that one can responsibly recommend an informant (qua expert) without knowledge of the purposes of the inquiry, which is to say that an informant's *expected* accuracy, *given* standards of accuracy, will be a determining factor for selecting him/her as an expert. These considerations plead against a purely veritistic account of expertise. Goldman (2001) holds that cognitive expertise should be defined in "veritistic" (*i.e.* truth-linked) terms:

> Experts in a given domain ... have more beliefs (or higher degrees of belief) in true propositions and/or fewer beliefs in false propositions within that domain than most other people (or better: than the vast majority of people) do ... To qualify as a cognitive expert a person must possess a substantial body of truths in the target domain. (Goldman 2001, p. 91).

> An expert ... in domain *D* is someone who possesses an extensive fund of knowledge (true belief) and a set of skills or methods for apt and successful deployment of this knowledge to new questions in the domain. (idem., p. 92)

However, one can, on this account, be a very reliable agent with respect to domain *D,* while not being in a position to deliver operationally accurate information about *D*. Nobody counts as an expert just because she is blindly amassing truths on the basis of reliable methods or processes. He/she should know which standards are operative in the context of inquiry, whether they can be realistically attained given the epistemic actions afforded by the environment, how refined the method should be by which they can be attained, and why the operative standards should be accepted by the intended audience that takes him/her to be the expert on the subject

[22] Reliability looks at the informant's competence to provide true information in a range of possible worlds, one of which is the actual one.

matter. Craig speaks of "indicator properties" as what an inquirer seeks to identify in an informant as a guide to her *truth-telling* ability (Craig 1999, p. 135). Our account of operational accuracy suggests an indicator property for experts: their ability to set appropriate standards of accuracy and to deliver on those standards.[23]

11.6 Conclusion

Ernest Sosa's famous analogy of the archer and her target is particularly helpful to illustrate our main claims: accuracy is to hit the point, and as she practices, she hits closer to the target and her accuracy improves (Sosa 2011). When her shots are more tightly clustered they are precise, and the archer has become more reliable. Hitting the intended target involves compensating for whatever is causing her precision to veer from the target – she is trying to map actual precision to the public standard of accuracy (hitting the point). Similarly, in inquiry, we want to be reliable agents who can provide exactly those truths that satisfy the operative standards of accuracy relevant in the context of inquiry. What counts as accurate information cannot be defined in terms of the truths an expert can detect just in virtue of being a reliable detector of truths. That would be like drawing a circle around clustered arrows on a board and then claiming that the target was hit. But it would turn *any* reliable method into one that yields accurate results. Practical goals, standards for accuracy, the reliability of one's epistemic methods in view of these goals and the operative standards set in view of these goals are interacting in practical epistemic rationality.[24]

References

Austin, J.L. 1962. *How to do things with words*. Oxford: Oxford University Press.
Borg, Emma. 2005. *Minimalism in semantics*. Oxford: Oxford University Press.
Braun, D., and T. Sider. 2006. Vague, so untrue. *Noûs* 41(2006): 133–156.
Braun, D., and T. Sider. 2007. Vague, so untrue. *Noûs* 41: 133–156.
Cappelen, H., and E. lePore. 2004. *Insensitive semantics*. Oxford: Blackwell.
Craig, William. 1999. *Knowledge and the state of nature*. Oxford: Clarendon.
Crane, Tim. 2014. *Aspects of psychologism*. Cambridge, MA: Harvard University Press.

[23] A good informant is not just someone who is sufficiently likely to be right about the issue (as Craig suggests) but also sufficiently accurate. Indicator properties of good informants need to indicate not just reliability but also their accuracy.

[24] Goldman (2009) seems to identify both values when he describes Sosa's view: "Like an archer's shot at a target, a belief can be accurate, it can manifest epistemic virtue or competent (roughly, reliability)." See http://plato.stanford.edu/entries/reliabilism/ (last consulted March 1, 2011).

Davidson, Donald. 2005. Truth rehabilitated. In *Truth, language and history*, ed. D. Davidson. Oxford: Oxford University Press.
Dummett, Michael. 1959/1978. *Truth and other enigmas*. London: Duckworth.
Elgin, Catherine Z. 2004. True enough. *Philosophical Issues* 14(1): 113–131.
Frege, G. 1918/1999. The thought: A logical inquiry. In *Truth*, ed. S. Blackburn and K. Simmons. Oxford: Oxford University Press.
Gibbard, Allan. 2007. Rational credence and the value of truth. In *Oxford studies in epistemology*, vol. 2, ed. Tamar Szabo Gendler and John Hawthorne, 143–165. Oxford: Oxford University Press.
Goldman, Alvin. 1986. *Epistemology and cognition*. Cambridge, MA: Harvard University Press.
Goldman, A. 1999. *Knowledge in a social world*. New York: Oxford University Press.
Goldman, A. 2001. Experts: Which ones should you trust? *Philosophy and Phenomenological Research* 63: 85–110. Reprinted in E. Selinger, and R. Crease (ed.). 2006. *The philosophy of expertise*. New York: Columbia University Press.
Goldman, A. 2009. Social epistemology: Theory and applications. *Epistemology. Royal Institute of Philosophy Supplement* 64: 1–18.
Grice, P. 1989. Logic and conversation. In *Studies in the way of words*, ed. H.P. Grice. Harvard: Harvard University Press.
Grimm, Stephen. 2008. Epistemic goals and epistemic values. *Philosophy and Phenomenological Research* 77(3): 725–744.
Haack, Susan. 1994. *Evidence and inquiry: Towards reconstruction in epistemology*. Oxford: Wiley-Blackwell.
Hallett, G.L. 1988. *Language and truth*. New Haven: Yale University Press.
Heal, Jane. 1988/89. The disinterested search for truth. *Proceedings of the Aristotelian Society New Series* 88: 97–108.
Hempel, Carl. 1965. *Aspects of scientific explanation and other essays in the philosophy of science*. New York: Free Press.
Hookway, C. 2007. Fallibilism and the aim of inquiry. *Proceedings of the Aristotelian Society Supplement* 81: 1–22.
Horwich, Paul. 1998. *Truth*, 2nd ed. Oxford: Oxford University Press.
James, William. 1907. *Pragmatism*. New York: Longman Green & Co.
Leitgeb, H., and Richard Pettigrew. 2010. An objective justification of bayesianism I: Measuring inaccuracy. *Philosophy of Science* 77(2): 201–235.
Levinson, Stephen. 2000. *Presumptive meanings*. Cambridge, MA: MIT Press.
Lynch, Michael. 2004. *True to life. Why truth matters*. Cambridge, MA: MIT Press.
Nozick, Robert. 1981. *Philosophical explanations*. Cambridge, MA: Harvard University Press.
Piller, Christian. 2008. Desiring the truth and nothing but the truth. *Noûs* 43: 193–213.
Schelling, T. 1960. *The strategy of conflict*. Cambridge: Harvard University Press.
Sosa, Ernest. 2003. The place of truth in epistemology. In *Intellectual virtue: Perspectives from ethics and epistemology*, ed. M. DePaul and L. Zagzebski, 155–180. Oxford: Oxford University Press.
Sosa, Ernest. 2011. *Reflective knowledge*. Oxford: Oxford University Press.
Tal, E. 2011. How accurate is the standard second? *Philosophy of Science* 78(5): 1082–1096.
Teller, Paul. 2004. How we dapple the world. *Philosophy of Science* 71: 425–447.
Teller, P. 2009. *Modelling the conception of truth* (draft, last downloaded March 7, 2009). http://philosophy.ucdavis.edu/paul/manuscripts-and-talks/Idealized%20and%20practical%20truth%208.pdf
Unger, Peter. 1975. *Ignorance: The case for skepticism*. Oxford: UP.
Van Fraassen, Bas. 2008. *Scientific representation*. Oxford: Oxford University Press.

Williams, B. 2002. *Truth and truthfulness*. Princeton: Princeton University Press.
Williamson, T. 2000. *Knowledge and its limits*. Oxford: Oxford University Press.
Zagzebski, Linda. 2004. Intellectual motivation and the good of truth. In *Intellectual virtue. Perspectives from ethics and epistemology*, ed. M. DePaul and Linda Zagzebski, 135–154. Oxford: Oxford University Press.